REMARKS

Claims 1 through 8 are pending in this Application. Applicants acknowledge, with appreciation, the Examiner's allowance of claim 8 and indication that claim 7 contains allowable subject matter. Accordingly, the only remaining issue pivots about the patentability of claims 1 through 6.

Claims 1 through 6 were rejected under 35 U.S.C. §103 for obviousness predicated upon Naito et al.

In the statement of the rejection, the Examiner identified differences between the claimed invention and the applied prior art, and indicated recognition of the factual inquiries mandated by *Graham v. John Deere Co., 86 S.Ct. 684, 383 U.S. 1, 148 USPQ 459 (1966)*. But the Examiner never followed through by providing a **factual basis** upon which to establish the requisite realistic motivation to modify the admittedly deficient Naito et al. to arrive at the claimed invention as judicially required. Moreover, the factual determinations made by the Examiner do not withstand scrutiny. Hence, Applicants strenuously traverse this rejection.

In imposing the rejection under 35 U.S.C. 103, the Examiner asserted that "... Naito et al. does **not explicitly teach** ..." various features of the claimed invention, including the third optical fiber and the requirement for (c2) to be shorter than the first optical fiber (emphasis supplied). When the Examiner says that Naito et al. "does not explicitly teach", he makes it sound like somewhere within Naito et al. there lurks some disclosure or suggestion as to what is not explicitly taught. But the Examiner does not follow through and identify any facts because he cannot. The simple fact is that there are **significant differences** between the claimed invention and Naito et al. As to these differences, Naito et al. are conspicuously mute.

The Examiner's statement "...Naito et al. does **not make the exact statement** ..." (Emphasis supplied) with respect to (c3) spliced to the free end of the second optical fiber is also misleading. There is no hint. There is no suggestion. There is nothing about splicing (c3)" to the free end of the second optical fiber.

Faced with the above **admitted lacuna** between the claimed invention and the only applied reference, the Examiner fails to provide any **factual basis** upon which to establish the necessary motivation. But the Examiner is under a judicially imposed procedural burden to make a "thorough and searching" factual inquiry, and to provide **fact-based reasoning** explaining **why** one having an ordinary skill in the art would have been realistically impelled to modify the admittedly deficient teachings of Naito et al. to arrive at the claimed invention. *In re Lee, 237 F.3d 1338, 61 USPQ2d 1430, 1433 (Fed. Cir. 2002)*. This the Examiner has not done.

Instead, the Examiner has asserted that one having ordinary skill in the art would have been motivated to modify the teachings of Naito et al. "because it is NWK[1] ..." to do so. NWK? Talk about judicially frowned upon generalizations.

As the Examiner should appreciate, in order to establish the requisite motivation, the Examiner must make **clear and particular factual findings** as to a **specific** understanding or **specific** technological principle which would have realistically impelled one having ordinary skill in the art to modify **particular prior art**, in this case the specific teachings of Naito et al., to arrive at the claimed invention. *Ruiz v. A.B. Chance Co., 234 F.3d 654, 57 USPQ2d 1161*

[1] In response to a telephone inquiry, the Examiner left a voice mail message retrieved on November 26, 2003, stating that "NWK" means "notoriously well known".

(Fed. Cir. 2000); Ecolochem Inc. v. Southern California Edison, Co. 227 F.3d 1361, 56 USPQ2d 1065 (Fed. Cir. 2000); In re Kotzab, 217 F.3d 1365, 55 USPQ 1313 (Fed. Cir. 2000); In re Dembiczak, 175 F.3d 994, 50 USPQ2d 1614 (Fed. Cir. 1999). Applicants stress that **generalizations** do not suffice. Specific facts are required. *Ecolochem Inc. v. Southern California Edison, Co., supra.; In re Rouffet, 149 F.3d 1350, 47 USPQ2d 1453 (Fed. Cir. 1998).*

What the Examiner has done is clearly legally erroneous. The Examiner has conjured up phantom prior art characterized as "notoriously well known" and then applied such phantom generalizations to the specific teachings of Naito et al. This approach is legally erroneous.

As held by the Court of Appeals for the Federal Circuit in *Teleflex Inc. v. Ficosa North America Corp., 299 F.3d 1313, 63 USPQ2d 1374, 1387 (Fed. Cir. 2002)*:

> The showing of a motivation to combine must be clear and particular, and it must be supported by actual evidence.

The Examiner has flunked this judicial test. NWKs are not specific objective facts. To whatever extent the Examiner is relying upon an officially noticed practice in the art, Applicants hereby challenge the Examiner to provide a factual basis for any such officially noticed fact. Failure to provide facts in response to such a challenge constitutes clear grounds for reversal. *Ex parte Natale, 11 USPQ2d 1222 (BPAI 1988); Ex parte Nouel, 158 USPQ 237 (Bd.App. 1967).*

The reason why Applicants challenge the Examiner to provide facts, is that what may or may not be known in **general** does not satisfy the judicial requirement for **clear and particular factual** findings as to a **specific** understanding or a **specific** technological principle which would have realistically impelled one having ordinary skill in the art to modify the **particular** teachings of Naito et al. to arrive at the claimed invention. *Ecolochem Inc. v. Southern California Edison, Co., supra.; In re Rouffet, supra.*

Moreover, what the Examiner has cavalierly announced as NWK-that an amplifying fiber has the same chromatic dispersion as fibers such as the first optical fiber, is specifically challenged. This is because an amplifier fiber can be designed to have various dispersions. In support of this position, Applicants submit herewith, as Exhibit A, a portion of a publication entitled "Optical Amplifiers and Their Applications" dated July 1-4, 2001, sponsored by the Optical Society of America. Applicants would invite the Examiner's attention to page OTuB2-3, Table II, wherein a type T-III fiber has a positive dispersion and a Type IV fiber as a negative dispersion. In this respect, Applicants will note that the applied reference to Naito et al. never discloses that +D or –D, and amplifier fiber have the same dispersion.

In contradistinction to the applied prior art, the claimed optical composition includes a first optical fiber and a third optical fiber, which have the same chromatic dispersion. This feature is neither disclosed nor suggested by the applied prior art nor by what the Examiner asserts is NWK.

Based upon the foregoing it should be apparent that a *prima facie* basis to deny patentability to the claimed invention has not been established for lack of facts and want of the requisite realistic motivation. Moreover, there are additional determinations of the Examiner which do not withstand scrutiny and which undermine the obviousness conclusion. Specifically, the Examiner asserted that the first and second optical fibers of the present invention correspond to the positive optical fiber (+D) and the negative dispersion fiber (-D) in Fig. 3 of Naito. The Examiner also asserted that the third optical fiber of the present invention corresponds the amplifier fiber of Naito et al. The Examiner assumed that +D, -D and an amplifier fiber can

form the optical fiber composite of the claimed invention. This determination is technologically wrong.

Specifically, the amplifier fiber of Naito et al. is installed in an optical amplifier. Therefore, it **cannot**, repeat **cannot,** be employed for adjusting a transmission property of an optical fiber composite. Clearly, the optical fiber composite comprising +D and –D and the amplifier fiber cannot achieve the object of the present invention.

The Examiner also ignored the **problem** addressed and solved by the claimed invention, which is a potent indicium of **nonobviousness**. *North American Vaccine, Inc. v. American Cyanamid Co., 7 F.3d 1571, 28 USPQ2d 1333 (Fed. Cir. 1993); Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 15 USPQ2d 1321 (Fed. Cir. 1990); In re Newell, 891 F.2d 899, 13 USPQ2d 1248 (Fed. Cir. 1989); In re Nomiya, 509 F.2d 566, 184 USPQ 607 (CCPA 1975).* Specifically, the present invention is addresses and solves problems attendant upon prior art practices, wherein degradation in the transmission quality occurs, as set forth at page 1 of the written description of the specification, line 13 through page 3, line 10. The present invention addresses and solves such problems by providing the strategically formulated optical fiber composite with a desired transmission property as a whole, even after a length of the fiber is cut off from one or both ends (page 3 of the written description, the specification, lines 12 through 14). Such advantages are not even a blip on the radar screen of Naito et al. Accordingly, under such circumstances the problem addressed and solved by the claimed invention must be given consideration.

Conclusion

It should, therefore, be apparent that a *prima facie* basis to deny patentability to the claimed invention has not been established for lack of the requisite factual basis and want of the requisite realistic motivation. Moreover, upon giving due consideration to the problem addressed and solved by the claimed invention, the conclusion appears inescapable that one having ordinary skill in the art would **not** have found the claimed invention **as a whole** obvious within the meaning of *35 U.S.C. 103. Jones v. Hardy, 727 F.2d 1524, 220 USPQ 1021 (Fed. Cir. 1984)*.

Applicants, therefore, submit that the imposed rejection of claims 1 through 6 under 35 U.S.C. 103 for obviousness predicated upon Naito et al. is not factually or legally viable and, hence, solicit withdrawal thereof.

Based upon the foregoing, Applicants submit that the imposed rejection has been overcome and that all pending claims are in condition for immediate allowance. Favorable consideration is, therefore, respectfully solicited.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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EXHIBIT A

2001

Optical Amplifiers and Their Applications

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OTuB2-1

Dispersion Managed L-Band Optical Amplifiers Employing High Gain Per Unit Length Erbium Doped Fiber

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Abstract: We have developed the EDF whose L-band gain is as high as 1.2dB/m. Combining the newly developed EDF with the conventional one, the dispersion-managed L-band EDFAs have been demonstrated, wherein the dispersion is reduced to 0.2ps/nm.

1.Intoroduction

In the demand for the higher transmission capacity and longer reach of wavelength-division-multiplexing (WDM) systems, transmission impairment caused by the fiber nonlinearity and/or the dispersion error has become an important limiting factor of the system performance. Especially, in the systems with the bit rate of 40Gbps, the dispersion tolerance of the system is considered as small as 100ps/nm. Recent study has elucidated that the not only the transmission fiber but also the erbium doped fiber amplifiers (EDFAs) can induce the fiber nonlinear effect, such as four-wave mixing (FWM), cross-phase modulation (XPM), and so on [1,2]. The contribution to the nonlinear impairment and the dispersion error is emphasized in the EDFAs for the longer-wavelength band (L-band), in which EDF is usually several times longer than that for the conventional band (C-band) EDFAs. The most effective countermeasure is shortening the required EDF length [2], which is also profitable to reducing the size, cost, polarization mode dispersion (PMD), and so on.

In this paper, we present the high gain per unit length EDF developed through the optimization of both the waveguide structure and the Er concentration. Employing this newly developed EDF, the dispersion-managed L-band EDFAs have been demonstrated, whose total dispersion is less than 0.2ps/nm over the wavelength range from 1570 to 1600nm whereas the total absorption peak of the employed EDF is more than 1000dB.

2. EDF design

There are two approaches to enhance the L-band gain per unit length. One is to increase the Er concentration, and the other is to increase the overlap between the mode field and the Er-doped area, namely the confinement factor [3]. The drawback of the former method is that Er concentration has an upper limit imposed by the concentration quenching.

Table 1 lists the EDF parameters of the cut-off shifted EDF (Type-I) [3], highly doped EDF (Type-II) [4], and newly developed EDF (Type-III). The Er-concentration of Type-III EDF was set to 2000wt.ppm, between that of Type-I and -II, exploring the upper limit imposed by the concentration quenching. The confinement factor can be enhanced by shifting the cut-off wavelength of the second-order mode close to 1480nm. Employing this technique, the L-band gain per unit length of 0.6dB/m has been demonstrated without the concentration quenching [3].

The power conversion efficiency (PCE) of these EDFs has been investigated employing the setup shown in Fig. 1-(a). The single-stage EDF is bi-directionally pumped with the equal power at 1480nm. The input signal power into the EDF has been set to +5 and +12dBm. Type-II EDF exhibits the slightly deteriorated PCE in comparison with Type-I and II. No degradation has been observed for Type-III EDF in comparison with Type-I EDF, while the L-band gain per unit length is almost twice of that of Type-I.

Table 1. Characteristics of EDFs designed for L-band optical amplification

	Absorption peak loss around 1530nm	Gain Per Unit Length	Δn	Cut-off wavelength	Er concentration
	dB/m	dB/m	%	nm	wtppm
Type-I	18	0.6	1.30	1450	1000
Type-II	48	1.8	1.30	1000	3700
Type-III	36	1.2	1.25	1320	2000

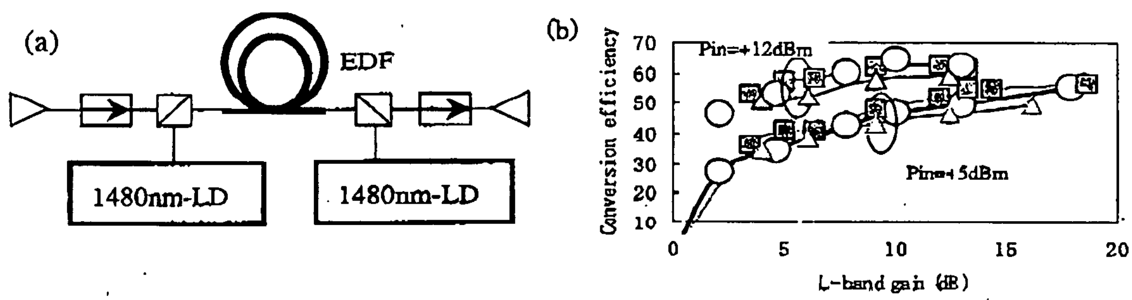

Figure 1. (a) Experimental setup to estimate the power conversion efficiency (PCE) of the EDFs listed in Table 1. (b) PCE as a function of the L-band gain for Type-I (circle) II (rectangle), and III (triangle) EDFs.

3. Dispersion managed L-band EDFA

For the high bit rate transmission systems, the dispersion management is desirable not only for the transmission fiber but also for the EDFAs. Figure 2 shows the dispersion managed L-band EDFA configuration. The first stage EDF is pumped at 980nm, and the second and third stage EDFs are pumped around 1480nm. The optical attenuator with the loss of 10dB is inserted between the second and third stages to simulate the dispersion compensating fiber (DCF). To realize a low noise figure (NF) and a high PCE simultaneously, the total absorption peak around 1530nm have been optimized to be 200, 400, and 400dB for first, second, and third stage EDFs respectively [5]. The maximum output signal power is +23dBm. Figure 3 shows the measured gain and NF when 16-channel WDM signals with the power of −14dBm/ch were inputted. The signal wavelengths have been allocated from 1574.5 to 1600.6nm with 200GHz spacing. Type-III EDF has been employed for the EDF-2 and -3, while the cut-off wavelength of EDF-1 must be shorter than 980nm and the EDF designed for C-band amplification (Type-IV) is employed for the first stage. Table 2 lists the characteristics of these two kinds of EDFs. It should be noted that Type-III and -IV EDFs exhibit the positive and negative dispersion over the L-band, respectively. In the dispersion-managed configuration, the EDF lengths are set to 22, 12, and 12m for EDF-1, -2, and −3, respectively (Case-2). As a reference, we have evaluated the EDFAs wherein only the Type-IV EDF is employed for all stage EDFs. In this case, both the lengths of EDF-2 and −3 are set to 44m (Case-1).

As the total absorption peak of the respective stage is determined in accordance with the optical amplification characteristics, it is essential to combine the EDFs with the desired absorption peak per unit length to cancel out the total dispersion. We must be attentive to the fact that the standard single-mode-fiber with the dispersion of +19ps/nm/km at 1585nm is usually used for the pigtail of the optical components, whose total length per EDFA sums up to about 10m per EDFA. Figure 4 shows the measured dispersion of the three-cascaded EDFAs. When all of the EDFs are Type-IV, the dispersion per EDFA is about −2ps/nm. On the other hand, the dispersion per EDFA is in the range from 0 to +0.2ps/nm employing the dispersion-managed configuration.

Table 2 Dispersion Characteristics of EDF Type-III and IV

	Absorption peak loss around 1530nm	Δn	Cut-off wavelength	Er concentration	Dispersion @1585nm(calc.)	Slope @1550nm(calc.)
	dB/m	%	nm	wtppm	ps/km/nm	ps/km/nm^2
Type-III	36	1.25	1320	2000	11.0	0.030
Type-IV	11	1.25	940	1000	-20.5	0.042

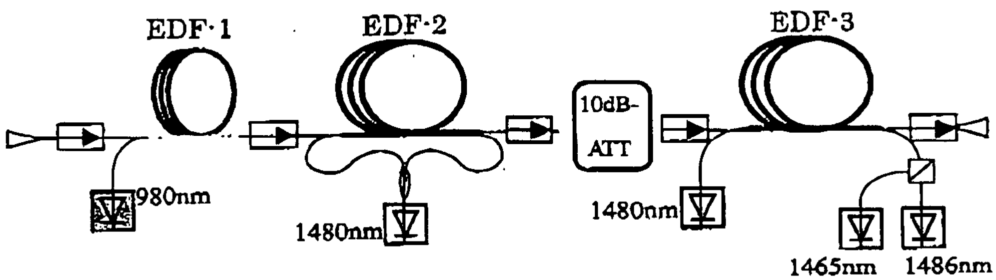

Figure 2 Configuration of the L-band EDFAs

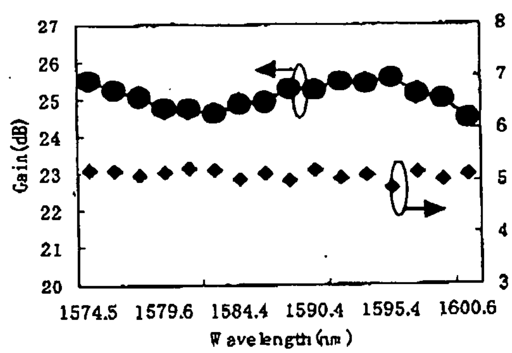

Figure 3 Gain and NF of EDFA shown in Fig.2

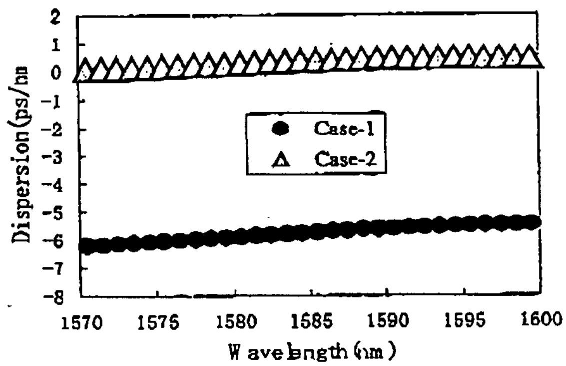

Figure 4: Total dispersion of three-cascaded EDFAs in Case −1 and −2.

4. Conclusion

To avoid the transmission impairment caused by the nonlinear effect and dispersion error in EDFAs, we have developed a high L-band gain per unit length EDF through optimizing both the waveguide structure and Er concentration. The L-band gain of 1.2dB/m has been achieved while there is no evidence of the PCE degradation for the Er concentration of 2000wt.ppm. Employing the newly developed EDF with the conventional EDFs for C-band, the dispersion managed L-band EDFAs have been demonstrated, whose dispersion is reduced to less than 0.3ps/nm.

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OCIS codes: 060.2320 Fiber optics amplifiers and oscillators, 250.4480 Optical amplifiers